PANEL FORMWORK SYSTEM

This invention relates to formwork system for use in casting prefabricated panels. The formwork system is particularly suited for use with wall panels and it will be convenient to hereinafter describe the invention in relation to this particular application. It should be appreciated however that the invention is not limited to prefabricated wall panels but rather is intended to include other panels such as floor slab panels.

BACKGROUND TO THE INVENTION

Conventional formwork system used in casting prefabricated wall panels are generally made up of cumbersome parts that must be assembled to define the sides of the panel to be cast. The formwork system generally includes a platform defining a surface of the panel and a number of side forms defining the sides of the panel to be cast. The side forms are normally braced to the platform by bolting the side forms to the platform. This is very time consuming, as it requires manual labour to bolt the side forms to the platform. Furthermore, to remove the cast panel from the formwork system, it is normally necessary to unbolt the bracing from the platform, which is again time consuming. This arrangement of bolting the side forms to the platform does not facilitate adjusting the relative positions of the side forms to adjust the width and length dimensions of the panel to be cast. In some methods, the width can be varied but the height of the wall panel is always fixed. Whilst these moulds allow flexibility in width, the holding method of side moulds are usually not firm and this leads to bulging at the edge of wall panel and escape of grout during casting of wall panels.

It would be advantageous to provide an improved formwork system that addressed this problem.

SUMMARY OF THE INVENTION

According to this invention, there is provided formwork system for use in casting prefabricated panels, the formwork system includes:

a support structure including a platform defining a surface of the panel to be cast, and a sub-structure supporting the platform;

a plurality of side forms being positionable on the platform to define sides of the panel to be cast;

each side form being braced by at least one brace structure connected to the support structure for bracing the plurality of side forms in position, each brace structure having adjustment means for permitting adjustment of the position of each side form on the platform to adjust the length and width dimensions of the panel to be cast.

It is preferred that each brace structure also includes an abutment connected to the sub-structure, a strut extending from the side form, the adjustment means providing a connection between the strut and the abutment that permits adjustment of the position of each side form on the platform.

The adjustment means in one preferred embodiment includes a threaded bore associated with the abutment and a threaded shaft forming at least in part the strut which is received by the threaded bore so that rotation of the shaft relative to the bore causes adjustment of the strut and the side form relative to the abutment.

The adjustment means in another preferred embodiment includes an edge associated with the abutment about which the strut pivots, a height adjuster is located at a distal end of the strut for adjusting the position of the distal end of the strut relative to the sub-structure, a proximal end of the strut engages the side form so that elevating the position of the distal end of the strut creates a clamping force at the proximal end of th strut clamping the side form in position on the platform. It is further preferred that the height adjuster includes a threaded bore associated with the distal end of the strut, and a threaded shaft received by the threaded bore, a distal end of the threaded shaft

engages the sub-structure so that rotation of the threaded shaft relative to the threaded bore causes the elevation of the distal end of the strut to alter, to thereby alter the clamping force.

It is still further preferred that the formwork system includes a plurality of sets of side forms each set varying in height to permit casting of panels of varying thickness.

Preferably the sub-structure includes steel beams and/or channels which provide support to the platform.

It is preferred that the platform is designed to impart a pattern into the surface of the panel.

It is also preferred that each side form is designed with a profile to impart a shape into the side of the panel to be cast.

DESCRIPTION OF PREFERRED EMBODIMENTS

The invention will be hereinafter described with reference to the accompanying drawings which illustrate two preferred embodiments of the invention. The drawings however are merely illustrative of how the invention might be put into effect, so that the specific form and arrangement of the features shown is not to be understood as limiting on the invention.

Figure 1.0 is a plan view showing the formwork system for casting prefabricated wall panels with retractable bracing according to the invention.

Figure 2.0 is a side view of a linear retractable bracing system according to one preferred embodiment of the invention.

Figure 3.0 is a side view of a lever retractable bracing system according to another preferred embodiment of the invention.

Figure 4.0 is a plan view showing the formwork system for casting prefabricated wall panels with pattern and decorative features.

Figure 5.0 is a cross section showing the formwork system for casting prefabricated wall panels with pattern and decorative features.

As shown in figure 1.0, the formwork system comprises a mould **1** supported by a support structure including a sub-structure of beams **2** and channels **3**, and two types of retractable bracing systems at the sides of the support structure.

According to the embodiment illustrated, linear **4** and/or lever **5** retractable braces are located adjacent the four sides of the support structure. Figure 2.0 and figure 3.0 describe the operation of the linear and lever retractable braces in more detail.

As shown in figure 2.0, linear retractable brace is fitted and held firmly to the sub-structure. The linear retractable brace illustrated consists of a horizontal threaded circular tube **6** that is mounted through a vertical hollow section **7**. The vertical hollow section **7** is fitted onto an abutment or bracket **8** that is welded to the I-beam **9** section of the sub-structure. The hollow section **7** is held firmly in place with the use of two pins that are inserted through holes **10** on the walls of vertical hollow section **7** and bracket **8**. The threaded circular tube **6** can be rotated by using the handle **11**. The other end of the threaded circular tube **6** is mounted onto a plate **12** that fits into the side form **13**. Rotation of the threaded circular tube **6** relative to the hollow section **7** allows the side form to be extended or retracted, and hence provides a guide for the side form **13** to be adjusted in order to produce the required height and width of wall panel.

The brace, as shown in figure 3.0, is a lever retractable brace fitted and held firmly to the substructure. This brace consists of a horizontal lever **14** that is mounted through a vertical hollow section **7**. The vertical hollow section **7** is fitted onto an abutment or bracket **8** that is welded to the I-beam **9** section of the

sub-structure. The vertical hollow section **7** is held firmly in place with the use of two pins that are inserted through holes **16** on the walls of vertical hollow section **7** and bracket **8**. A distal end of the horizontal lever **14** has a threaded shaft **17** with a handle **18** on top that extends vertically to the I-beam section **9** of the sub-structure. The proximal end of the horizontal level **14** projects downwards to be in contact with the base **19** of the side formwork **13**. Rotation of the handle **18** in one direction gives the threaded shaft **17** a tight contact down vertically with the I-beam **9** section of the sub-structure. This results in a force being exerted downwards at the proximal end of the horizontal level **14** that is in contact with the base **19** of the side form **13**. By tightening the threaded shaft **17** to the I-beam **9** section of the sub-structure at the distal end of the horizontal lever **14** using the handle **18**, a downward force will be exerted on the proximal end of the horizontal lever **14** that will lead to the horizontal lever **14** clamping down to the base **19** of the side form **13**. This action of the lever retractable brace allows the side form **13** to be in firm and tight contact with the base of the mould **20** that will prevent the escape of grout during casting wall panels and bulging at the edges of wall panels.

The side form can be formed using aluminium or mild steel.

Shear key joint can be cast in the prefabricated wall panel by using the appropriate profile of side form. This shear key, coupled with starter bars, provides a very strong interlocking and high building strength after the joints in between the wall panels have been cast.

As shown in figure 4.0 and figure 5.0, the platform may, if desired, be shaped to impart various patterns and decorative features to the prefabricated wall panels. Using differently shaped modules can vary the pattern of any decorative features. Patterns on the wall surface can be designed by incorporating specially designed channels **21**, **22** in the platform. The patterned channels **21**, **22** are extruded using aluminium. By using these patterned channels **21**, **22**, the shape of the protruded pattern on the wall can be varied. The patterned channels **21**, **22** can be eliminated if no design is required. This can be done by either replacing the pattern channel with a flat plate or filling the

pattern channel with concrete to obtain a flat surface. The recessed pattern on the wall panel can be incorporated by placing a timber board on the wall mould. A door or window opening **23** can be incorporated by either casting together with the door or window frame, or the area **23** is blocked using a formwork. The door or window frame is held firmly to the wall mould using steel hollow section tightened with fasteners.

The width of the mounts varies with an increment of 1 m by using standard length of retractable clamping system; each size of mould allows flexibility by adjusting the width of wall panel of up to 500 mm on each side.

The standard formwork mould can cast up to a height of 3.6 m. The formwork system mould can be extended with a modular extension mould. With the extended formwork system mould, higher heights of wall panel can be prefabricated. The extension mould also has a set of retractable clamping systems around its three sides. The length of side formwork is adjusted accordingly to achieve different height of wall panels. With the adjustability of the moulds, the number of different moulds for casting prefabricated wall panels of various sizes is greatly reduced.

The formwork system as hereinbefore described has many advantages over conventional formwork system. These advantages stem principally from the ability for the brace structure of the invention to be adjustable to adjust the position of the side forms on the platform. This allows a single formwork system to cast a range of panels all varying in height and length.

Various alterations, modifications and/or additions may be introduced into the constructions and arrangements of parts previously described without departing from the spirit or ambit of the invention as defined by the appended claims.